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A NEW GEOGRAPHY OF PLANTS.

Pflanzen- und Tierverbreitung. Von Alfred Kirchhoff. Hann, Hochstetter, Pokorny, Allgemeine Erdkunde. Fünfte Auflage, von J. Hann, Ed. Brückner und A. Kirchhoff. iii. Abteil. Mit 157 Abbild. im Texte, u. 3 Karten in Farbendruck. Pp. 327. (Prag u. Wien: F. Tempsky. Leipzig: G. Freytag, 1899.)

TO see a portion of my special domain surveyed by an authority in another branch of science appeals to me in a particularly interesting and instructive light, especially if it comes from a man of judgment and broad views. Such a survey may expose any bias, and is likely to open up new vistas. Dr. Kirchhoff, professor in the University of Halle, is a geographer of repute, and naturally approaches the facts of distribution of plants and animals from a point of view different to that of a botanist or zoologist. It is true his book is intended as an introduction to phytogeography and zoogeography for the student of physical geography, and not as a critical essay on these branches; yet its merits seem to demand that we should rank it higher and judge it accordingly. It is not a mere abstract of one of the few well-known treatises on the distribution of plants and animals, made to serve as a text-book for the beginner, but the product of a mind evincing a considerable power of assimilation of matter, necessarily foreign to it in many of its details, and with an admirable grasp of that which is essential. With these accomplishments are combined the gift of a lucid exposition and of a language which is, apart from certain idiosyncrasies of expression, clear and pleasant.

The author reminds the reader in the preface that in the earlier editions of Hann, Hochstetter and Pokorny's "Allgemeine Erdkunde," the corresponding part was written by Dr. A. Pokorny; that the progress of phyto- and zoo-geography has rendered it necessary to recast the whole; and that it is written more especially for the students of geography, and excursions into the domain of the naturalist had therefore to be avoided. Yet geography on the one side, and botany and zoology on the other, overlap to such an extent within the compass of phyto- and zoo-geography, that the author was naturally obliged to fall back over and over again on the botanist or zoologist, who supplied him, if I may say so, with the woof to his warp. It is here where, as one might expect, the weak points of the book become evident; and it is a pity that the author did not avail himself of the aid of a competent botanist for final revision. I suppose the same applies to the zoological details. Reckless statements, as, for instance, that a single individual of *Sisymbrium sophia* produces 720,000 seeds, or that most of the 854 species of the Egyptian flora are introduced, or that Southern Italy (exclusive of Sicily) possesses 3132 species against 9000 for the whole of British India, &c., can hardly be excused by the desire of putting the case as emphatically as possible. Instances of a decided looseness of expression in describing certain facts would have been discovered at once by a botanical critic, e.g. when the author says, on p. 18, that the plants derive

their "principal food" from the soil, while he applies the same term, on p. 24, to the carbon dioxide of the atmosphere; when he quotes the orchids and aroids of the equatorial zone as examples of parasites (p. 19), although he describes them quite correctly as epiphytes in another place; and again, when he attributes "genuine grass leaves" to the Australian *Xanthorrhoea* (p. 112). Slips, also, like that on p. 162, where the "Rose of Jericho" is figured as *Asteriscus pygmaeus*, a member of the order of Compositæ, but described in the text as a "little Cruciferous plant (*Anastatica hierochuntica*)," or on p. 198, where the author speaks of the "Kompositengeschlecht der . . . Cæsalpinien," call for the helping hand of the botanist. Willows are not wind-fertilised (p. 51); *Rhododendron ponticum* is by no means killed by -2°C . (p. 86); the peach has not originated in Southern Asia (p. 135); there is no transformation of our ordinary grape-vine into an evergreen plant in the tropics; these are statements which should be repeated no longer in text-books. It would be easy to quote a good many more mistakes of this order, but I do not wish to dwell on them more than is necessary to show where, in a future edition, careful revision must be undertaken.

The book is divided into three parts. The first part occupies 139 pages, and deals with general telluric conditions in relation to the organised world, the second (88 pages) with the phytogeographical divisions (Flora-reiche), the third (100 pages) with the zoogeographical divisions (Faunareiche). The first part is subdivided into five sections, dealing with (1) the reproductive and migratory capacities of the organisms, (2) the natural conditions of vegetable and animal life, (3) the variability of organisms, (4) the Theory of Descent and its geographical proofs, and (5) the general principles of the distribution of plants and animals. To condense this abundance of matter into 139 pages is a very difficult task, and that it has been done on the whole so satisfactorily says much for the judgment of the author.

In the following two parts, Prof. Kirchhoff has set himself the task of characterising the principal geographical divisions of the organic world, relying, of course, on the researches of the recognised authorities in phyto- and zoo-geography, but viewing them from the more comprehensive standpoint of the geographer, as it appeared to him "desirable for a more vivid comprehension of the nature of the countries of the globe." The separation of the vegetable and the animal kingdom into floras and faunas, their distribution in the present, their harmony with the physical character of their respective areas, and their mutual adaptation within each area, are the result of a process of evolution in which the shaping, selecting, separating and shifting forces have been, for both kingdoms, the same to such an extent that a far-reaching parallelism in their geographical differentiation is to be expected *a priori*. This has been, perhaps, too often lost sight of by specialists.

On the other hand, the modern geographer, from the very fact that he starts with conditions bringing about that parallelism, would be naturally led to a more uniform conception of the differentiation of the organic world into floras and faunas. The result of this has been, in Prof. Kirchhoff's case, the almost complete congruence of the

two maps representing the "Florareiche" and the "Faunareiche" respectively. Much might be said with respect to the divisions adopted by the author, but space forbids.

The book is abundantly illustrated, and most of the illustrations are well selected and quite to the point; but exception might perhaps be taken to some of the pictures in which the author attempts to represent as many types as possible in one plate, with the usual consequence that the *ensemble* looks unnatural and untrue. The map showing the distribution of the European species of *Asplenium* (p. 89) is not very illustrative and scarcely in place; whilst Kerner's maps dealing with *Tubocytisus* (pp. 90, 91) require thorough revision, although they are excellent so far as method is concerned.

OTTO STAPP.

FOUNDATIONS OF AGRICULTURE.

Agricultural Botany—Theoretical and Practical. By John Percival, M.A. (Cantab.), F.L.S. Pp. xii + 798. (London: Duckworth and Co., 1900.)

THE professor of botany at the South-Eastern Agricultural College at Wye has done well to depart from the utterly inefficient standard of text-books in this subject hitherto set and followed in this country; and, although we do not think the best possible has yet been produced, the present work is so distinctly an improvement, and so clearly sounds the right note, that we have no hesitation in recommending it as *the* elementary handbook for the agricultural student. What it lacks most conspicuously is a clear enunciation of the principle underlying the teaching of botany to students of agriculture, and it will be just as necessary for the teacher using this book, as it is for him who uses others, to emphasise the point of view (lost sight of in nearly all our text-books) that the plant is a focussing centre in which are concentrated the materials gathered by roots and leaves and the solar energy fixed by the chlorophyll-action, so that plant substance—be it in a cabbage, a potato, a crop of wheat or an oak forest—represents a real gain of energy from the surrounding universe, stored up with an equally real recovery of material which would otherwise have been lost to us because dissipated into the atmosphere in an unavailable form. It is this which makes farming, planting, forestry and other branches of agriculture so fundamentally different from the mining industries, where the coal, iron, &c., brought from their storehouse in mother earth are merely temporary sources of wealth representing expenditure of capital.

As regards features of technical detail, there are several interesting departures from the repetitions of previous text-books, and our chief regret is that these are not more original in conception and treatment. For instance, the section on recognition of trees and shrubs by means of twigs in winter is a very welcome one, but it might have been made far better. Again, the part dealing with our common grasses could have been improved by bolder departures from, and less reliance on, Continental and other authorities in common use, though it should be pointed out that the author has, at any rate, provided new drawings of the "seeds" of most of

the grasses. This, however, not always with advantage—*e.g.* the very bad figure (210) of Yorkshire fog. Nor do we regard the summary of characters leading to the recognition of grasses by their leaves as either adequate or worthy of the scope of the book; it might have been made much better with a little attention to points not included in ordinary pamphlets on the subject.

These are faults to be remedied in later editions, and must not be allowed to outweigh the really excellent portions of the book dealing with the various large groups of cultivated farm-plants—*e.g.* Chapter xxv., dealing with the hop, is well done, as are Chapters xxxiv.–xxxviii., dealing with those very difficult subjects, the varieties of our cereals. Indeed, we may commend the whole of this part of the work which treats of the classification and special botany of farm crops, with few reservations, such as those hinted at above, as an admirable summary of what the student should direct his attention to in this department of his studies. The general botany is also fairly well done; and although we do not consider the section on "Internal Morphology" quite happy either as regards selection of subjects or treatment of details, we have little but praise for the part dealing with physiology, which is so markedly in advance of the stuff we are too apt to meet with in existing agricultural text-books in this country, that we prefer to dwell only on its merits. The chapters on weeds and on diseases of farm-plants are also distinctly better than those in any previous English works dealing with agricultural botany, and we heartily congratulate the author on his exhibition of capacity in the rôle of a teacher of elementary students of agriculture. At the same time, we would point out that much may be done in future editions to improve this subject, and still more in improving and extending the account of the doings of bacteria in the soil. The agricultural student ought to be made to realise that the soil is a matrix, in which the rocks and salts, water and other lifeless constituents, play little more than the subordinate parts of a skeleton or scaffolding, on and between which the real work of conversions, transferences, destructions and constructions of materials necessary for the life of higher plants are being carried out by lower organisms of many different kinds. A vivid picture of the struggles of root-hairs for salts and oxygen, of the relations between anaërobic and aërobic organisms, of the dangers of attack from parasites here, and of the missing of advantageous connections with symbiotic helpmeets there, and of the mutual interactions of the living and non-living factors in keeping up the "fertility," moisture, heat, &c., of the complex soil, would be a fitting subject for a chapter designed to knit together the enormous number of facts here thrown down before the unwary student, and among which he is sure to stumble and flounder.

The ideal here sketched is not an easy one to attain, and we are aware that facts are coming in every day, and that our knowledge of the factors concerned is still in its infancy. Nevertheless, it is no empty compliment to the author to point out that there are indications in the present book that he would be quite capable of putting the crown to his really excellent attempt at an elementary text-book for agricultural students,